



-1-

We claim:

1 1. Apparatus for providing a web-accessible virtual
2 processing environment to a network-connected office
3 server for a remotely connected user computer through
4 which a user stationed at the computer can execute any of
5 a plurality of server-based applications resident at the
6 office server, comprising:

7 a platform, capable of being situated in network
8 communication between the user computer and the office
9 server, having:

10 a processor;

11 a memory connected to the processor and for
12 storing computer executable instructions therein;

13 first and second network interfaces, operable
14 in conjunction with the processor, for interfacing the
15 platform, through the first network interface, to a wide
16 area network (WAN) connection through which the remote
17 user computer obtains connectivity to the platform, and,
18 through the second network interface, to a local area
19 network (LAN) having a server computer electrically
20 communicative thereover, respectively, with the server
21 computer forming the office server; and

22 wherein, in response to the executable
23 instructions, the processor, for each one of the
24 server-based applications:

25 provides, through a corresponding client
26 application module implemented on the platform for each
27 of the server-based applications, bi-directional protocol

28 conversion of messages between the remote user computer
29 and the office server, such that user interaction data,
30 intended for a specific one of the server-based
31 applications and provided by a browser executing on the
32 remote user computer in a first protocol, is converted
33 into a second protocol associated with said one
34 server-based application and then applied to the
35 server-based application at the office server, and output
36 data, provided by said specific one server-based
37 application, is converted from the second protocol to the
38 first protocol for being transmitted to the user computer
39 and graphically rendered thereat, through the browser, to
40 the user.

1 2. The apparatus in claim 1 wherein the processor, in
2 response to execution of the stored instructions:

3 for messages emanating from the user computer and
4 appearing on the WAN connection:

5 receives, from the browser, a first message
6 containing the user interaction data associated with a
7 specific one server-based application and in the first
8 protocol;

9 converts the user interaction data in the first
10 protocol to the second protocol associated with the
11 specific one server-based application to yield a second
12 message; and

13 applies the second message, as input, to the
14 server computer for processing by the specific one
15 server-based application; and

16 for messages emanating from the server computer and
17 appearing on the LAN:

18 receives, from the server computer and over the
19 LAN connection, a third message containing output data
20 generated by the specific one server-based application
21 and in the second protocol;

22 converts the output data message in the second
23 protocol to the first protocol to yield a fourth message;
24 and

25 applies the fourth message to the WAN
26 connection for transmission to the browser in order to
27 render the output data thereat.

1 3. The apparatus in claim 2 wherein the server computer
2 comprises a corresponding server for each of the
3 server-based applications and is implemented either
4 coincident with the platform or as at least one physical
5 computer separate from the platform and connected, via
6 the LAN, to it.

1 4. The apparatus in claim 3 further comprising, in the
2 platform, a separate corresponding software-implemented
3 application module for each of the specific server-based
4 applications for providing protocol translation of the
5 user interaction data and output data between the first
6 and second protocols; the application module comprises:

7 a user interaction component communicative, through
8 the WAN connection, with the browser, for accepting the
9 user interaction data from the browser in the first

-4-

10 protocol and for providing said output data to the
11 browser in the first protocol;
12 a state machine, communicative through an
13 application processing interface with the user
14 interaction component, for interpreting each command
15 issued by the user interaction component so as to provide
16 the user interaction data to the specific one
17 server-based application executing on the server
18 computer, and communicative through a client protocol
19 component, for sending user interaction data to the
20 server-based application and for receiving said output
21 information from the specific one server-based
22 application; and

23 a client protocol component, operative in
24 conjunction with the state machine, for converting the
25 user interaction data received from the state machine
26 into the second protocol and applying resultant messages
27 in the second protocol to the specific one server-based
28 application, and for receiving said output data in the
29 second protocol from the specific one server-based
30 application and applying said output data to the state
31 machine.

1 5. The apparatus in claim 4 wherein the server-based
2 applications comprise thin-client application hosting,
3 e-mail and shared file access; and the first protocol
4 comprises HTTP, secure HTTP, or a protocol with AIP-like
5 functionality and the second protocol comprises RDP

-5-

6 (remote desktop protocol), IMAP (Internet mail access
7 protocol) or SMB (server message block).

1 6. The apparatus in claim 5 wherein the user
2 interaction data comprises a designation of a uniform
3 resource locator (URL), uniform resource identifier
4 (URI), form input, keystrokes or mouse clicks that
5 returns associated information desired by the user, and
6 output data comprises graphical display data.

1 7. The apparatus in claim 6 wherein said output data
2 comprises bitmap graphic output display data generated by
3 the specific one server-based application.

1 8. The apparatus in claim 7 wherein the WAN connection
2 comprises either a private network connection or an
3 Internet connection.

1 9. The apparatus in claim 8 wherein the second network
2 interface comprises an Ethernet interface, and the first
3 network interface comprises a broadband network
4 interface.

1 10. The apparatus in claim 9 wherein the broadband
2 network interface comprises a digital subscriber line
3 (DSL) interface, a cable modem, an integrated services
4 digital network (ISDN) interface, a T1 interface or a
5 fractional T1 interface.

1 11. A method for use, in apparatus, which provides for
2 providing a web-accessible virtual processing environment
3 to a network-connected office server for a remotely
4 connected user computer through which a user stationed at
5 the computer can execute any of a plurality of
6 server-based applications resident at the office server,
7 the apparatus comprising a platform, capable of being
8 situated in network communication between the user
9 computer and the office server, having: a processor, a
10 memory connected to the processor and for storing
11 computer executable instructions therein; first and
12 second network interfaces, operable in conjunction with
13 the processor, for interfacing the platform, through the
14 first network interface, to a wide area network (WAN)
15 connection through which the remote user computer obtains
16 connectivity to the platform, and, through the second
17 network interface, to a local area network (LAN) having a
18 server computer electrically communicative thereover,
19 respectively, with the server computer forming the office
20 server; wherein, the method comprises the steps,
21 performed by the processor, for each one of the
22 server-based applications:
23 providing, through a corresponding client
24 application module implemented on the platform for each
25 of the server-based applications, bi-directional protocol
26 conversion of messages between the remote user computer
27 and the office server, wherein the providing step
28 comprises the steps of:

29 converting user interaction data, intended for
30 a specific one of the server-based applications and
31 provided by a browser executing on the remote user
32 computer from a first protocol into a second protocol
33 associated with said one server-based application so as
34 to yield converted user interaction data;

35 applying the converted user interaction data to
36 the server-based application at the office server;

37 converting output data, provided by said
38 specific one server-based application, from the second
39 protocol to the first protocol so as to yield converted
40 output data; and

41 transmitting the converted output data to the
42 user computer to be graphically rendered thereat, through
43 the browser, to the user.

1 12. The method in claim 11 further comprising the steps
2 of:

3 for messages emanating from the user computer and
4 appearing on the WAN connection:

5 receiving, from the browser, a first message
6 containing the user interaction data associated with a
7 specific one server-based application and in the first
8 protocol;

9 converting the user interaction data in the
10 first protocol to the second protocol associated with the
11 specific one server-based application to yield a second
12 message; and

13 applying the second message, as input, to the
14 server computer for processing by the specific one
15 server-based application; and

16 for messages emanating from the server computer and
17 appearing on the LAN:

18 receiving, from the server computer and over
19 the LAN connection, a third message containing output
20 data generated by the specific one server-based
21 application and in the second protocol;

22 converting the output data message in the
23 second protocol to the first protocol to yield a fourth
24 message; and

25 applying the fourth message to the WAN
26 connection for transmission to the browser in order to
27 render the output data thereat.

1 13. The method in claim 12 further comprising the SEP of
2 implementing a corresponding server for each of the
3 server-based applications either coincident with the
4 platform or as at least one physical computer separate
5 from the platform and connected, via the LAN, to it.

1 14. The method in claim 13 further comprising the step
2 of providing protocol translation of the user interaction
3 data and output data between the first and second
4 protocols through a separate software-implemented
5 application module for each of the specific server-based
6 applications; wherein the application module comprises:

7 a user interaction component communicative, through
8 the WAN connection, with the browser, for accepting the
9 user interaction data from the browser in the first
10 protocol and for providing said output data to the
11 browser in the first protocol;

12 a state machine, communicative through an
13 application processing interface with the user
14 interaction component, for interpreting each command
15 issued by the user interaction component so as to provide
16 the user interaction data to the specific one
17 server-based application executing on the server
18 computer, and communicative through a client protocol
19 component, for sending user interaction data to the
20 server-based application and for receiving said output
21 information from the specific one server-based
22 application; and

23 a client protocol component, operative in
24 conjunction with the state machine, for converting the
25 user interaction data received from the state machine
26 into the second protocol and applying resultant messages
27 in the second protocol to the specific one server-based
28 application, and for receiving said output data in the
29 second protocol from the specific one server-based
30 application and applying said output data to the state
31 machine.

1 15. The method in claim 14 wherein the server-based
2 applications comprise thin-client application hosting,
3 e-mail and shared file access; and the first protocol

-10-

4 comprises HTTP, secure HTTP, or a protocol with AIP-like
5 functionality and the second protocol comprises RDP
6 (remote desktop protocol), IMAP (Internet mail access
7 protocol) or SMB (server message block).

1 16. The method in claim 15 wherein the user interaction
2 data comprises a designation of a uniform resource
3 locator (URL), uniform resource identifier (URI), form
4 input data, user keystrokes or user mouse clicks that
5 returns associated information desired by the user, and
6 the output data comprises graphical display data.

1 17. The method in claim 16 wherein said output data
2 comprises bitmap graphic output display data generated by
3 the specific one server-based application.

1 18. The method in claim 17 wherein the WAN connection
2 comprises either a private network connection or an
3 Internet connection.

1 19. The method in claim 18 wherein the second network
2 interface comprises an Ethernet interface, and the first
3 network interface comprises a broadband network
4 interface.

1 20. The method in claim 19 wherein the broadband network
2 interface comprises a digital subscriber line (DSL)
3 interface, a cable modem, an integrated services digital

-11-

4 network (ISDN) interface, a T1 interface or a fractional
5 T1 interface.